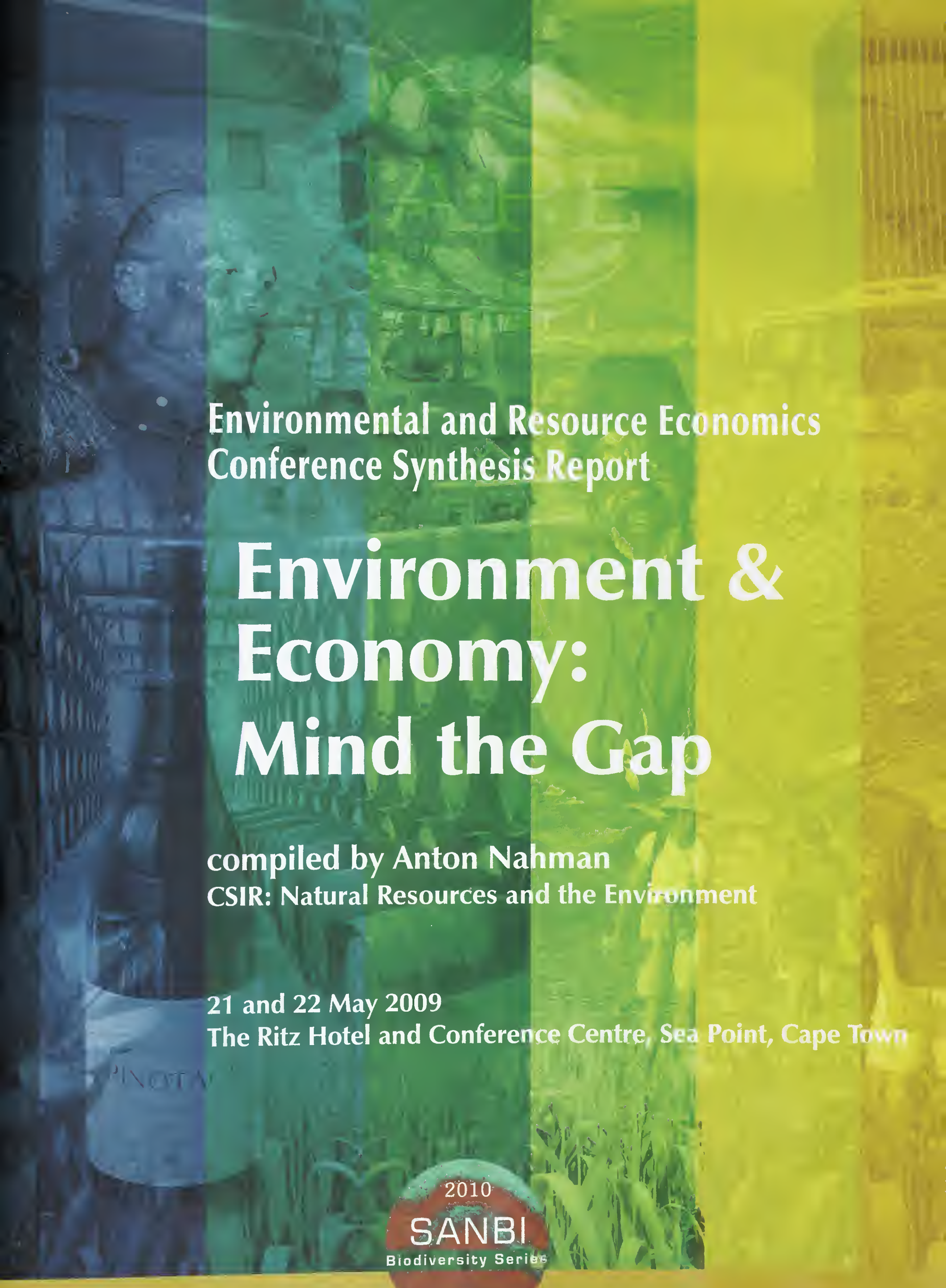

Environmental and Resource Economics
Conference Synthesis Report

Environment & Economy: Mind the Gap

compiled by Anton Nahman
CSIR: Natural Resources and the Environment

21 and 22 May 2009
The Ritz Hotel and Conference Centre, Sea Point, Cape Town

2010
SANBI
Biodiversity Series
17

Acronyms

ASSET Africa's Search for Sound Economic Trajectories
C.A.P.E. Cape Action for People and the Environment
CBA Cost-benefit analysis
CEEPA Centre for Environmental Economics and Policy in Africa
CSIR Council for Scientific and Industrial Research
DBSA Development Bank of Southern Africa
DEAT Department of Environmental Affairs and Tourism
DST Department of Science and Technology
DWAF Department of Water Affairs and Forestry
DWEA Department of Water and Environmental Affairs
ERE Environmental and resource economics
EPR Extended producer responsibility
EPRU Environmental Policy Research Unit (UCT)
FEE Forum for Economics and the Environment
FETWater Framework Programme for Research Education and Training in Water
IAP Invasive alien plant
MBI Market-based instrument
NGO Non-governmental organisation
ODA Organisation Development Africa
PES Payments for ecosystem services
R&D Research and development
REDD Reduced emissions from deforestation and degradation
SANBI South African National Biodiversity Institute
SOE State-owned enterprise
TMF Table Mountain Fund (WWF)
UCT University of Cape Town
WfW Working for Water
WRM Water resources management
WWF World Wide Fund for Nature

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SANBI Biodiversity Series

The South African National Biodiversity Institute (SANBI) was established on 1 September 2004 through the signing into force of the National Environmental Management: Biodiversity Act (NEMBA) No. 10 of 2004 by President Thabo Mbeki. The Act expands the mandate of the former National Botanical Institute to include responsibilities relating to the full diversity of South Africa's fauna and flora, and builds on the internationally respected programmes in conservation, research, education and visitor services developed by the National Botanical Institute and its predecessors over the past century.

The vision of SANBI: Biodiversity richness for all South Africans.

SANBI's mission is to champion the exploration, conservation, sustainable use, appreciation and enjoyment of South Africa's exceptionally rich biodiversity for all people.

SANBI Biodiversity Series publishes occasional reports on projects, technologies, workshops, symposia and other activities initiated by, or executed in partnership with SANBI.

Compiler's contact details:
Council for Scientific and Industrial Research
PO Box 320
7599 Stellenbosch
South Africa
Email: anahman@csir.co.za
Tel: +27(0)21 888 2403
Fax: +27(0)21 886 6518

Technical editing: Hanlie van Heerden
Design & layout: Sandra Turck
Cover design: Sandra Turck

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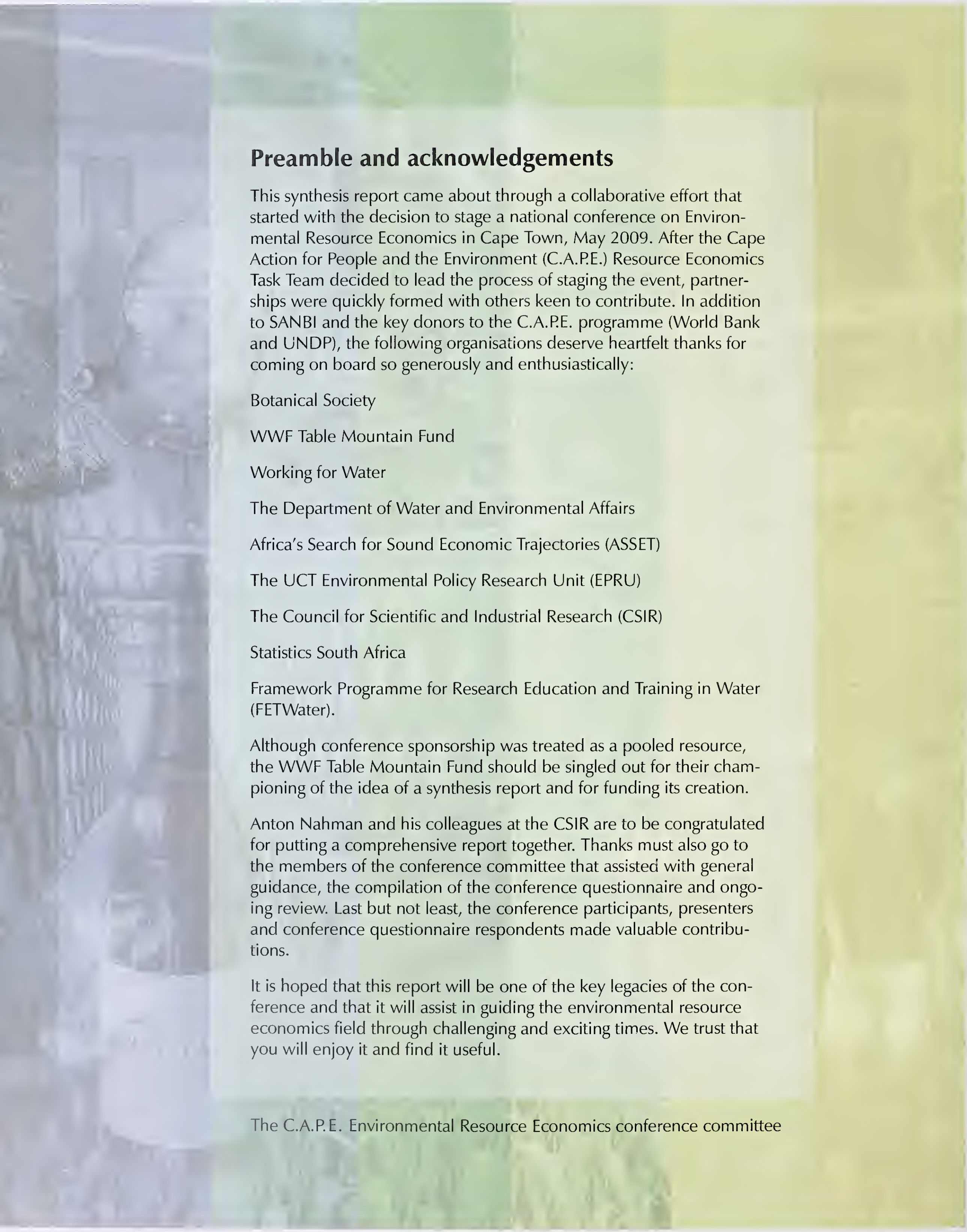

Preamble and acknowledgements

This synthesis report came about through a collaborative effort that started with the decision to stage a national conference on Environmental Resource Economics in Cape Town, May 2009. After the Cape Action for People and the Environment (C.A.P.E.) Resource Economics Task Team decided to lead the process of staging the event, partnerships were quickly formed with others keen to contribute. In addition to SANBI and the key donors to the C.A.P.E. programme (World Bank and UNDP), the following organisations deserve heartfelt thanks for coming on board so generously and enthusiastically:

Botanical Society

WWF Table Mountain Fund

Working for Water

The Department of Water and Environmental Affairs

Africa's Search for Sound Economic Trajectories (ASSET)

The UCT Environmental Policy Research Unit (EPRU)

The Council for Scientific and Industrial Research (CSIR)

Statistics South Africa

Framework Programme for Research Education and Training in Water (FETWater).

Although conference sponsorship was treated as a pooled resource, the WWF Table Mountain Fund should be singled out for their championing of the idea of a synthesis report and for funding its creation.

Anton Nahman and his colleagues at the CSIR are to be congratulated for putting a comprehensive report together. Thanks must also go to the members of the conference committee that assisted with general guidance, the compilation of the conference questionnaire and ongoing review. Last but not least, the conference participants, presenters and conference questionnaire respondents made valuable contributions.

It is hoped that this report will be one of the key legacies of the conference and that it will assist in guiding the environmental resource economics field through challenging and exciting times. We trust that you will enjoy it and find it useful.

The C.A.P.E. Environmental Resource Economics conference committee

1. Introduction

1.1 Background: Environmental Resource Economics (ERE) in South Africa (SA)

Environmental and resource economics (ERE) is a subdiscipline of economics that is concerned with the interactions between the economic system and the natural environment to which it is intrinsically linked. It aims to understand the economic causes and consequences of environmental (and, increasingly, social) problems, and to formulate rigorous insights and advice to support policy makers and managers to deal with, and/or prevent such problems. In particular, it can contribute to policy- and decision-making regarding the allocation and management of land, water and other natural resources, as well as the management of pollution and waste to meet social, economic and environmental goals – thus contributing to sustainable development (Nahman *et al.* 2009). Some of the tools developed by environmental and resource economists are described in Box 1.

ERE is therefore particularly relevant in a developing country such as South Africa (SA), where complex tradeoffs between economic, social and environmental objectives must often be made. Many South Africans are simultaneously faced with poverty, degraded environments and limited access to safe drinking water and sanitation (Human Sciences Research Council 2004; Kates & Dasgupta 2007). Unemployment is at least 25% and may be as high as 45% (South African Cities Network 2004), while the incidence of diseases such as HIV/Aids and malaria is high and increasing (Shisana & Simbayi 2002; Department of Health 2004). Socio-economic systems are heavily reliant upon the natural resource base, and therefore vulnerable to global change (Council for Scientific and Industrial Research 2002). It is clear that SA faces a desperate need for rapid social and economic development to achieve

Box 1:

The environmental and resource economics toolkit

- **Economic-valuation tools** measure the monetary value of natural resources, ecosystem goods and services, or environmental impacts. It is a source of valuable information in cases where market prices are missing, the information is inadequate, or because of externalities (Pearce 1993; Smith 1993; Bateman *et al.* 2003; Perman *et al.* 2003).
- **Decision-support tools** enable the comparison of development options/tradeoffs (e.g. cost-benefit analysis, cost-effectiveness analysis, ecological-economic modelling, inputs to conservation planning, etc.).
- **Natural resource accounts and macro-economic indicators** enable the expansion of the system of national accounts to monitor the impacts of development on the natural resource base and assess progress toward sustainable development. Examples include 'green accounts' for particular resources, green domestic/national product, genuine savings, and inclusive wealth (Hamilton & Clemens 1999; Dasgupta & Maler 2001; Arrow *et al.* 2003; Harris *et al.* 2004; World Bank 2006).
- **Market-based (or incentive-based, or economic) policy instruments** are aimed at changing behaviour and include a wide range. Some instruments, such as taxes, charges and tradable permits, aim to ensure that producers and consumers pay for (internalise) the external costs of their activities. It therefore aids the reduction of pollution and other negative externalities, and facilitates more efficient resource allocations (Pigou 1920; Magnani 1973; Pearce 2002). Payments for ecosystem services (PES), another market-based instrument (MBI) that is becoming increasingly prominent, aims to provide incentives for the provision of positive externalities, such as payments for catchment protection services (Pagiola *et al.* 2002; Wunder 2007; Jack *et al.* 2008). A PES scheme can be defined as a 'voluntary, conditional agreement between at least one 'seller' and one 'buyer' over a well defined environmental service – or a land use presumed to produce that service' (Wunder 2007).

the Millennium Development Goals. Consequently, decision-makers in SA have tended to prioritise social and economic development agendas, often at the expense of environmental integrity. A case in point is the 'Accelerated Shared Growth Initiative for South Africa' (ASGISA) of 2006, an over-arching macroeconomic framework guiding all policy development in SA until 2014, which explicitly subordinates environmental goals to its socio-political and economic goals of halving unemployment (to below 15%) and reducing poverty (to less than one-sixth of households) by 2014. It aims to achieve this through the promotion of continuous economic growth at an average 5% per year (Republic of South Africa 2006).

Nevertheless, there is increasing recognition of the effects of this bias towards the attainment of socio-economic goals on the natural resource base, of society's dependence upon nature, and of the importance of maintaining a healthy ecosystem capable of providing the goods and services necessary for a prosperous society. In response to this improved understanding and to meet its obligations under Agenda 21 (United Nations 1993) and the Johannesburg Plan of Implementation (World Summit on Sustainable Development 2002), the South African government released its 'National Framework for Sustainable Development in South Africa' in June 2007 (Department of Environmental Affairs and Tourism 2007). This strategy identifies five priority areas for strategic intervention based on analyses of trends in South Africa's natural, economic and social (including governance) capital, namely:

1. Enhancing systems for integrated planning and implementation.
2. The sustainable use of ecosystems.
3. Investing in sustainable economic development and infrastructure.
4. Creating sustainable human settlements.
5. Responding appropriately to emerging human development, economic, and environmental challenges (Department of Environmental Affairs and Tourism 2007).

The implementation of such interventions requires decision-making and action, and these decisions will often require that complex tradeoffs are made between economic, social and environmental objectives. Environmental and resource economics is well suited to the resolution of precisely these types of tradeoffs (Munasinghe 2007; Baumgartner *et al.* 2008).

In SA, the potential contributions of ERE were first recognised at a policy level in the 1990s, when, in response to growing international environmental awareness and increased recognition of the ability of MBIs to alleviate environmental problems in developed countries, the former Department of Environmental Affairs and Tourism (DEAT) commissioned a series of investigations into the use of MBIs for addressing environmental problems in SA (Department of Environmental Affairs and Tourism 1993a,b, 1996, 1997). These initiatives have continued into the new millennium, with the National Treasury commissioning investigations into environmental fiscal reform, specifically investigating the role that environmentally related taxes and charges could play in supporting sustainable development in SA (National Treasury 2006).

Two publications in particular led to an increase in the use and application of ERE to inform natural resource management in SA. These were the 'Brundtland Report', which was influential in popularising the concept of sustainable development, and South Africa's new Constitution (Republic of South Africa 1996), which stresses the rights of everyone, including future generations, to a healthy, protected environment; it emphasises the 'polluter-pays' principle, whereby polluters are responsible for paying the costs (including external costs) associated with the damage caused as a result of their activities (De Lange *et al.* 2008).

1.2 A two-day national conference on environmental resource economics

Interest and activity in the ERE field in SA continues to grow, fuelled by a greater appreciation of the need to understand the economic causes and consequences of environmental and social problems, and to formulate economically sound solutions. However, opportunities for learning, sharing ideas and disseminating new knowledge are relatively limited. A regular conference focused specifically on ERE in SA does not exist, while other conferences that do provide a space for ERE-related topics are infrequent at best. Clearly, there is an urgent need for a regular forum to share insights, report on progress, feed into policy and implementation, and generally chart the way forward for the field in SA.

The South African National Biodiversity Institute (SANBI), through its Cape Action for People and the Environment (C.A.P.E.) programme, recognised the opportunity to act as a catalyst in this regard. It hosted a two-day national conference on ERE in Cape Town on 21 and 22 May 2009, with the aim of providing the type of forum referred to above. Its partners in hosting the event included the Botanical Society, the WWF Table Mountain Fund, Working for Water (WfW) and the Department of Environmental Affairs (DEA), Africa's Search for Sound Economic Trajectories (ASSET), the UCT Environmental Policy Research Unit (EPRU), the Council for Scientific and Industrial Research (CSIR), Statistics SA, and the Framework Programme for Research, Education and Training in Water (FETWater).

The conference had a relatively broad focus on ERE as it applies to natural resource management, including the economics of:

- Biodiversity conservation.
- Water resources management, with particular emphasis on the management of natural aquatic environments.
- Agricultural resource management, with particular emphasis on the management of natural landscapes.
- Climate change as it relates to natural resource management questions.
- Marine resources management.

It brought together those with an interest in ERE from the public and private sectors, academia and consultancy to share results of recent research and to discuss issues relevant to the practical application of ERE. By creating a mutual platform for those who commission work and those who undertake it, the conference aimed to contribute to the effective use of ERE for environmental policy and management, as well as influence the implementation and research agenda. In essence, it strived to match theoretical inputs with practical considerations regarding policy and implementation.

The conference therefore provided a platform to facilitate the kind of necessary interaction referred to above. In order to build on these interactions, it was thought appropriate to compile a synthesis report that broadly summarises the key outcomes of the conference. The report focuses specifically on implementation with the intention to maximise the potential for exploiting key implementation lessons and opportunities. It is hoped that the outcomes of the conference itself, augmented by this report, can be used to guide future directions, approaches and work within the ERE field in SA.

1.3 Objectives of this report

The objectives of this synthesis report are:

1. To review and document the progress, current status and future trends with regard to ERE research and development in SA.
2. To collate and document the outcomes of the conference with regard to implementation, including that which focused on Payments for Ecosystem Services and other key topics in the field.
3. To understand the key areas within ERE that should reward future effort and investment, particularly from an implementation perspective.

The report is structured as follows. Section 2 summarises the data and methods used to address the three objectives. Section 3 reviews the progress, status quo and future trends of ERE in SA in terms of capacity, research, and implementation. Section 4 highlights the key outcomes of the conference with respect to implementation, while Section 5 draws out key recommendations and conclusions.

2. Data and methods

Data pertaining to the objectives listed above were obtained from a review of the ERE field in SA written prior to the conference (Nahman *et al.* 2009); from the conference presentations and discussions, including a plenary discussion forum on trends in ERE and the state of the discipline in SA; and from responses to a conference questionnaire that was distributed to delegates. All of this provided the delegates with an opportunity to share lessons and personal insights.

The conference attracted a total of 205 delegates from a variety of sectors (Figure 1)[1], of which only 53 returned their questionnaires (26% response rate). Figure 2 shows the distribution of questionnaire respondents in terms of the capacity within which they are involved in environmental issues. Fifty-three percent of respondents described themselves as being involved in environmental issues as a researcher or academic, 40% as a practitioner or consultant, 21% as working for an NGO or civil society, 19% as a manager, 11% as a policy maker, and 6% in a funding capacity. Others were students, worked for government, or, in only one case, came from the corporate world. As expected, when the breakdown of delegates (Figure 1) was compared with that of respondents (Figure 2), researchers/academics and practitioners/consultants appeared relatively more willing to complete the questionnaire (as they were likely to be more concerned with issues pertaining to the field in which they work, as compared to delegates from other sectors).

Figure 3 shows the distribution of respondents by area of environmental management in which they work. As expected, given the focus of the conference on natural resource management, approximately 47% of respondents were involved in land-use planning and management (including agriculture), 42% in water resources management, 38% in management of land-based conservation areas, 36% in issues related to climate change, and 11% in marine resources management. Others were involved in the management of pollution and waste,

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[1] Thank you to Martin Nicol of Organisation Development Africa (ODA) for this breakdown of delegates. SOEs = state-owned enterprises; NGOs = Non governmental organisations; DBSA = Development Bank of Southern Africa.

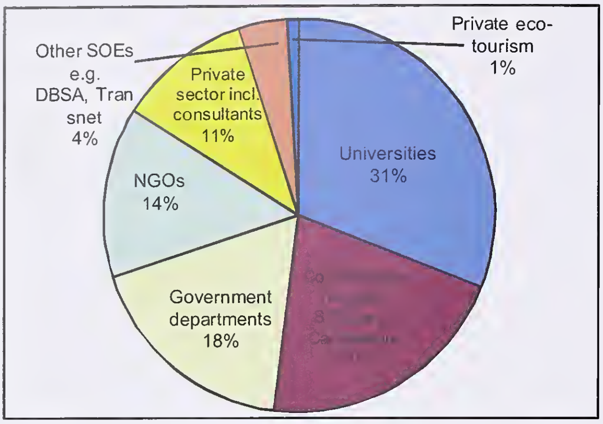

Figure 1 Breakdown of delegates by sector.

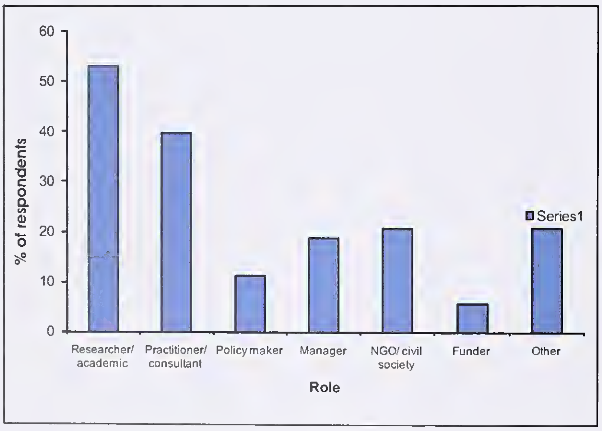

Figure 2 Breakdown of respondents by role in environmental issues (more than one option allowed).

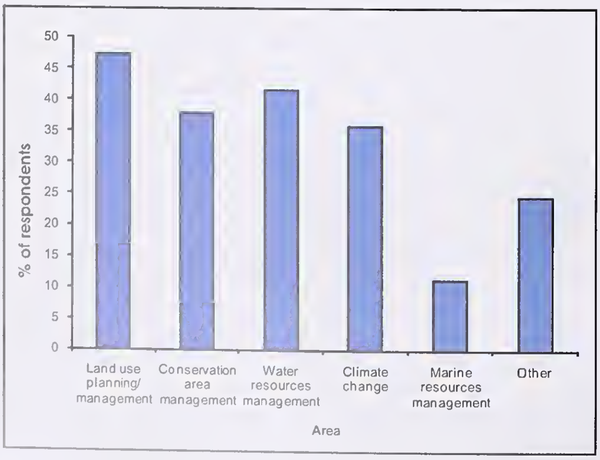

Figure 3 Breakdown of respondents by area of environmental management.

ecosystem goods and services, or invasive alien plants; in sustainable harvesting (e.g. of fynbos or resources from communal and protected areas) or sustainable agriculture; or in environmental assessment, reporting or education.

Finally, familiarity with ERE tools and their application was normally distributed among the respondents, with 68% of respondents describing their familiarity with the discipline as either 'medium', 'low', or 'very low'. This implies a need for education and awareness raising, a point which came out strongly during the conference and which is discussed in more detail in later sections of the report.

3. Progress, status quo and future trends for ERE in SA

3.1 Capacity

Important role players with respect to ERE capacity development in SA include the major universities, as well as a small number of university-based research units and centres. These include the Centre for Environmental Economics and Policy in Africa (CEEPA, University of Pretoria), which offers degree (Masters and PhD) and non-degree training and scholarships in environmental economics and policy, and the recently established Environmental Policy Research Unit (EPRU, University of Cape Town), which provides 'in-service' and postgraduate training programmes focused on environmental policy analysis and research. Furthermore, the Council for Scientific and Industrial Research (CSIR) supports various options for students and graduates in ERE to further their training, including studentships and internships. Finally, ASSET Research is a non-profit NGO that undertakes collaborative research and capacity-building in the fields of ecology, economics and development. It aims to address skills shortages in interdisciplinary thinking related to economics and the environment, including such shortages in the field of ERE, by linking public/private research funding and ERE student development (ASSET Research 2009; De Wit 2009a).

ASSET Research shares links with universities and with the Forum for Economics and the Environment (FEE), a professional association for the ERE community in SA established in 1999 (Blignaut & De Wit 2002a). Prior to the conference, the Forum had attracted 472 members. Its main objective is information dissemination through a listserver (economics4environment@yahoogroups.com). With an average of four messages per month, the focus is not on lengthy discussions of ERE-related topics, but rather on announcements with regard to employment opportunities in (South) Africa, conferences and other events (De Wit 2009a). It also provides a training manual on environmental economics and natural resource policy analysis on its website, which is available to download (http://www.econ4env.co.za). ASSET Research will administer both the listserver and the FEE website in future.

Sixty-five percent of respondents to the questionnaire agreed that the quality of practitioners and researchers in SA has improved over the last five years, while only 2% disagreed (see Figure 4).

However, although respondents agreed that the *quality* of practitioners and researchers has improved, they believed that the *quantity* of practitioners and researchers has not increased quickly enough to meet the increased demand for ERE services in the country. According to one respondent, 'the problem of too few ERE practitioners/researchers was identified over a decade ago and nothing has changed'. There are therefore limited skills and capacity to address the growing demand, and a clear need for capacity-building to increase the number of environmental and resource economists in SA. This requires developing and implementing a plan for building ERE research and development capabilities and capacity[2]. At the same time, increased capacity will have to be matched by increased demand from the public sector over the longer term for investment in such capacity development to be justified. There is indeed evidence of such an increase in demand (seen, for example, in government's recent emphasis on research with 'impact'), which should in turn drive supply.

A possible reason for this lack of ERE practitioners/researchers is the relatively limited size, young nature and low profile of the discipline in SA, which means that it is unable to attract students. According to one delegate, there is too much focus at the postgraduate level, and insufficient investment in the undergraduate level, leaving the 'base' of ERE students too small. However, South African academic and research institutions have increased undergraduate teaching in ERE since the early 1990s, which is reflected in the growing number of undergraduate ERE students and courses offered by universities (Blignaut & De Wit 2002a,b; Antrobus 2009). According to a lecturer at one of the smaller universities in SA, the third-year environmental economics class has grown from around 30 students in 2003 to 100 in 2008, suggesting that the subject is becoming more popular, and that the undergraduate 'base' of ERE students is growing.

The problem, however, seems to lie in insufficient follow-through from the undergraduate to postgraduate levels, and therefore in getting people qualified as ERE practitioners/researchers. In SA, the lack of high-quality ERE postgraduate programmes, the shortage of lecturers and supervisors, and of strong university-based ERE groups are some of the reasons for the low rate at which people are qualified. It is no surprise then that graduates in ERE pursue their training and interests overseas, or pursue careers in different fields[3] (although initiatives such as the recently established EPRU referred to above should help improve this situation). In all likelihood, there is a need for government to invest in both the undergraduate levels (to grow the ERE base), and in the postgraduate levels (to ensure that students from the undergraduate level follow through to becoming qualified). Government support should not, however, be restricted to financial investment. There is a need for other types of government support in the field through tertiary institutions, e.g. providing support that fast-tracks processes for getting ERE courses, degrees and diplomas developed, approved and implemented within tertiary (and other) institutions (it currently takes around two years for a new degree programme to be approved). It is crucial that a greater emphasis is put on post-degree initiatives, such as internships and other forms of on-the-job training that can offer graduates an attractive start to their professional lives.

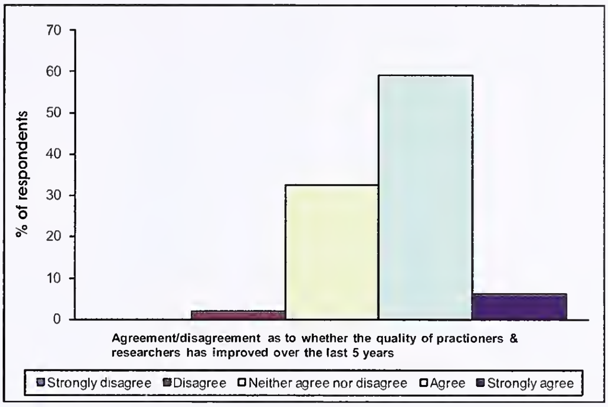

Figure 4 Extent to which quality of ERE researchers and practitioners has improved.

In addition, many students come through the system and qualify as environmental or resource economists, but end up working in different fields or sectors. In all likelihood, therefore, a significant 'latent' supply of potential ERE practitioners exists, suggesting the need for a comprehensive database of people trained in ERE and for a drive to attract and recruit potential ERE practitioners. There is also a need to create awareness of capacity-building success stories.

The issue of building capacity in interdisciplinary thinking was raised by a number of respondents to the questionnaire. For example, the need to be able to show linkages to social and biophysical issues (i.e. a holistic social-ecological system view) was seen as important, as was the need to understand the socio-economic and ecological resilience of such systems. Respondents also referred to the significance of linking economic data with spatial data to show spatial linkages and interdependencies.

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[2] One step in this direction is a Department of Science and Technology (DST) project currently under way at the CSIR, which aims to develop a plan for building research capacity in the economics of global change and sustainability.

[3] Some students, however, do their postgraduate studies in Agricultural Economics, and then move back to ERE after qualifying.

It follows therefore that a need exists to develop systems thinking and an improved understanding of ecology (rather than a narrow focus on monetary values) among ERE practitioners and researchers, and for ERE to become more integrated with other disciplines (particularly the natural sciences) if it is to make an impact on natural resource policy and management[4]. For example, Turpie (2009) and De Lange *et al.* (2009) attempt to link economic and spatial data in order to provide economic analyses that are more spatially explicit. However, it is important to find a balance between adopting a holistic, integrated, transdisciplinary view in which all of the issues are covered, and presenting findings that are too broad/general and that would not have an impact on, or be taken up by decision-makers (Massey & Hamman 2009).

Other recommendations relating to the issue of capacity-building included:

- The need to link up with Sector Education & Training Authorities (SETAs).
- The need to find champions to structure a strategy for capacity-building.
- The need to improve knowledge of ERE among the interested community, e.g. by providing short courses (such as those already presented to the former Department of Water Affairs and Forestry (DWAF), among others).
- The need to educate scholars and students and to raise awareness and interest in the field among all members of society, e.g. by incorporating ERE into primary, secondary, tertiary and continuing education curricula[5].
- The possibility of 'merging' with agricultural economics. In many other countries, the ERE and agricultural economics fraternities and institutions are often grouped together or at least well integrated, whereas in SA they are relatively far removed from each other.
- The possibility of developing a degree programme specifically in ERE (rather than the current situation, where aspiring environmental and resource economists graduate with degrees in economics, or agricultural economics).

Finally, existing ERE capacity in SA is not well co-ordinated. In this respect, a number of delegates identified the need for a working group to identify priorities and research gaps, and to develop a research plan for the field in SA. Establishing a framework for ERE research in SA would ensure better co-ordination of research. Furthermore, most participants agreed that there was a need for conferences and other such events on a more frequent basis, although not necessarily in the same format. For example, there should perhaps be smaller events more often, focused on particular topics, rather than trying to cover the entire scope of ERE in a single event. However, for this to be possible, the issue of funding has to be addressed. Although there is some interest from other partners, and some ad hoc funding, a need exists for someone to make a long-term time and financial commitment, in partnership with others in the field, instead of relying on ad hoc funding.

3.2 Research

ERE research productivity and outputs have increased in recent years, reflected in the growing number of publications in which ERE has been applied to inform and evaluate environmental policy and management since 1990 (Blignaut & De Wit 2002a,b). Although there are no South African journals devoted specifically to ERE, such research is published in journals such as *Agrekon*, *Development Southern Africa*, the *South African Journal of Economic and Management Sciences*, the *South African Journal of Economics,* and the *Journal of Energy in South Africa*. Much of the ERE research in SA is also of international relevance and has been published in journals such as the *Journal of Environmental Management*, the *Journal of Environmental Economics and Management*, and *Ecological Economics* (Blignaut & De Wit 2002a,b; Nahman *et al.* 2009).

ERE research initiatives in SA are problem-driven and have tended to focus on seven main areas or issues:

1. The impacts and control of invasive alien plants (IAPs).
2. Valuation of ecosystem services[6], primarily biodiversity, carbon sequestration, and water.
3. Livelihoods and poverty.
4. Pollution and waste.
5. Climate change mitigation and adaptation (including energy and food security).

---

[4] While it is important for ERE to incorporate insights from non-economists/natural scientists (Abrahamse 2009), economics also has to be incorporated more firmly in the natural sciences. For example, respondents felt that ERE should become incorporated more strongly into classical conservation thinking to support this sector and ensure that its ideas are mainstreamed. Furthermore, ecological research questions should be formulated in such a way that the answers can be 'translated' into their economic consequences.

[5] One suggestion for getting young learners interested in ERE was to present television shows (e.g. BBC World's Nature Inc & Earth Report; CNN's EcoSolutions) that present fundamental ideas of ERE in an entertaining way using layman's terms.

[6] Progress has also been made regarding the mapping of ecosystem services, the impact on values of changes in ecosystem quality, and the integration of this understanding into conservation and development planning (e.g. Blignaut *et al.* 2008; De Lange *et al.* 2009).

6. Agriculture and forestry.
7. Natural capital restoration.

For example, the 50 papers presented at the conference (excluding those by invited international speakers) focused on the following topics (see Figure 5):

1. Land (26 papers); including issues related to:
- land-use planning, management and change
- agriculture, forestry and mining
- soil
- land-based conservation and restoration
- urban areas
- invasive alien plants
- terrestrial biodiversity and ecosystem services
- livelihoods and poverty.

2. Water (eight papers).
3. Climate change (three papers).
4. Marine (five papers).
5. Natural resource accounts and macro-economic issues/indicators (four papers).
6. Pollution and waste (four papers).

The main focus of the conference was on natural resources management; most attendees were involved in terrestrial and water resources management (see Figure 3). Thus, to some extent, the distribution of topics shown in Figure 5 was expected, and does not necessarily reflect the overall distribution of ERE research activity in SA.

The distribution of conference paper topics (Figure 5) is compared with the areas of environmental management in which respondents are involved (Figure 3).[7] In Figure 6, the left column for each area shows the percentage of all responses indicating involvement in that area of environmental management, while the right column shows the percentage of papers at the conference devoted to each particular topic. It can be seen that the distribution of papers presented was more or less in line with the interests and areas of involvement of attendees.

Respondents to the questionnaire were asked to identify three important topics for future ERE research, listing them in order of importance. Firstly, responses to this question were collated, coded and grouped together into categories relating to **areas** of research. Each response was then scored (a score of '3' was given if the area was listed first — i.e. of greatest importance, '2' if it was listed second, and '1' if it was listed third). Lastly, the scores were aggregated to obtain total scores for each area (in terms of the frequency with which the area was mentioned, weighted by the importance respondents attached to it). Figure 7 presents the results with respect to important areas for future research in ERE. Specific issues under each category are discussed below. Again, however, the dominance of land and water issues was expected, given the interests and activities of the conference attendees; it does not necessarily imply that these are the most important issues for future research in SA. Indeed, it has been suggested that the dominance of these types of responses reflects a lack of frontier thinking, and that a needs-driven research programme that focuses on priorities and research gaps is needed. This will be discussed again in the recommendations section of this report.

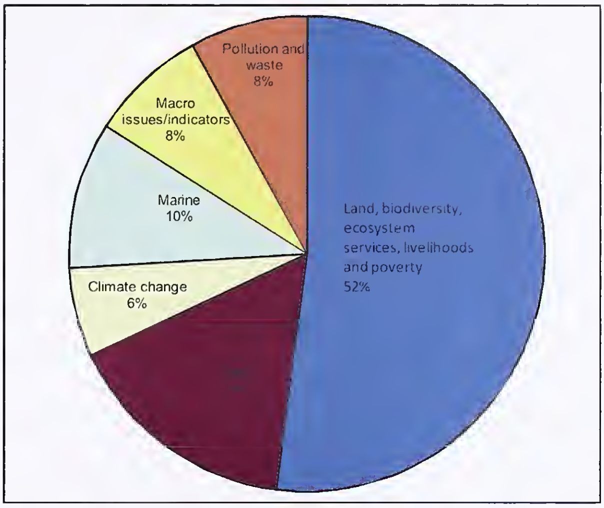

Figure 5 Conference paper topics.

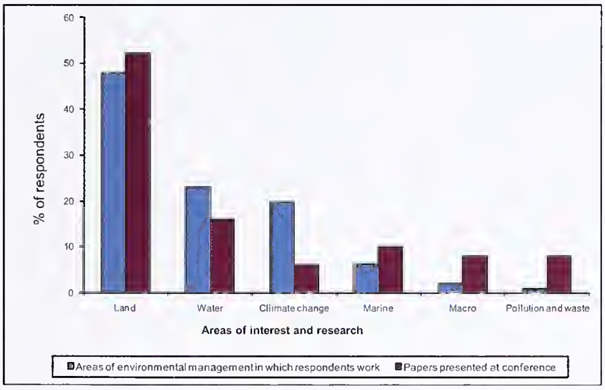

Figure 6 Research needs and priorities compared with actual research activity.

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[7] However, note that in Figure 6, 'land-use planning and management' and 'conservation area management' are combined into a single 'land' category.

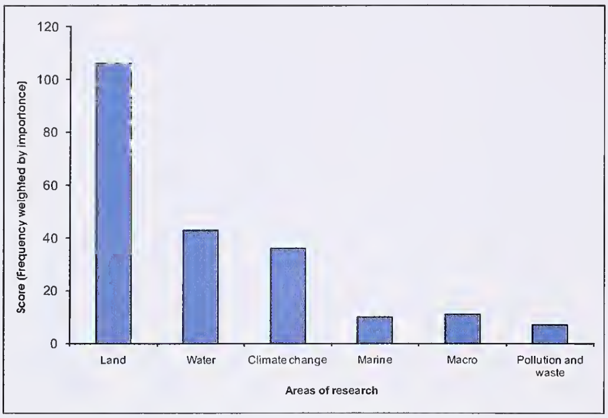

Figure 7 Important areas for future ERE research.

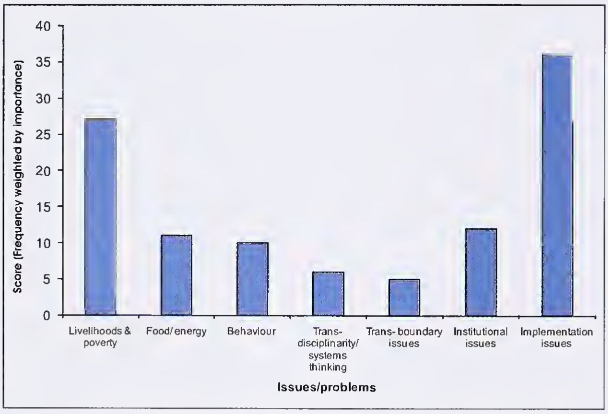

Figure 8 Important issues and problems to address in future research.

The '**land**' category was defined broadly to include issues related to land-use planning, management and change; agriculture, forestry and mining; soil; land-based conservation and restoration; urban areas; invasive alien plants; terrestrial biodiversity and ecosystem services; and livelihoods and poverty. Specific issues emerged here, including carbon emissions/sequestration related to land-use and land-use change, the value of ecosystems and ecosystem services (in terms of their contribution to the economy and/or to livelihoods), and the need to develop innovative mechanisms to ensure financing for conservation and restoration.

Within the broad category of '**water**', respondents highlighted the need for research regarding the role of ERE in contributing to water resources management (WRM); issues related to water allocation and use (e.g. sustainable use in industry and mining, and the assessment of externalities in water use); issues related to water security and tradeoffs (e.g. with carbon, biodiversity, bio-energy and waste), particularly within the context of global change; and the development of water accounts and indicators (e.g. a water 'footprint' for SA).

Within the broad category of '**climate change**', the main research needs centred around the contribution of ERE to climate change policy, including carbon taxes (particularly comparing taxes and other incentive-based instruments); payments for carbon sequestration; and reduced emissions from deforestation and degradation (REDD). The emphasis was on greater integration of ERE into policy and decision-making[8]. Other research needs included assessing the impacts and costs of climate change, pricing carbon emissions, and assessing tradeoffs between carbon sequestration and biodiversity/water conservation. Furthermore, a study[9] on South African research capacity in the economics of global change and sustainability has found that most research in the economics of climate change is done in mitigation, while adaptation is largely left untouched. Moreover, the connections between climate change and other issues (e.g. water and livelihoods) are not often made, leaving these issues to be considered in isolation, instead of looking at them as part of a bigger picture, i.e. in a holistic way.

Beyond these specific areas of application, respondents also highlighted certain cross-cutting **problems/issues** that have to be understood and dealt with. These included:

- Issues related to livelihoods, poverty and sustainable use of natural resources, including community-based natural resource management, poverty alleviation, and benefit-sharing.
- Food and energy issues (including food and energy security, externalities associated with energy generation and distribution, and bio-energy).
- Issues related to producer and consumer behaviour.
- Issues related to transdisciplinarity and systems thinking, such as socio-economic systems and resilience.
- Transboundary issues, such as management of oceans and other transboundary resources.
- Institutional issues.
- Issues related to mainstreaming and implementing ERE in management, policy and decision-making, including issues related to knowledge brokering.

These were analysed in the same way as the 'areas' of research above, and the results are presented in Figure 8.

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[8] For example, during discussions in one of the parallel sessions, the need was highlighted for ERE to influence decisions such as that taken by the South African government on the building of new coal-fired power plants, namely, to lower the costs associated with renewable energy relative to fossil fuels by

[9] The study refers to a DST project currently under way at the CSIR, which aims to develop a plan for building research capacity in the economics of global change and sustainability.

Importantly, many respondents highlighted the need to find ways of mainstreaming and implementing ERE into management, policy and decision-making as an important issue for future research. Key issues and specific recommendations relating to implementation are discussed in Sections 4 and 5.

Finally, respondents highlighted important research and policy **tools** (or sets of tools) that have to be developed and applied across the various research areas in order to address the issues and challenges identified above. These included valuation tools, decision support tools (including cost-benefit analysis), natural resource accounts and macro-economic indicators, economic or market-based policy instruments (including taxes, such as carbon taxes; and incentives, such as REDD), PES, and other tools for leveraging investment in conservation and restoration (including biodiversity credits, stewardship, and conservation easements). These were again analysed as above, and the results are presented in Figure 9.

Valuation and PES featured prominently, as expected. Perceived research needs with regard to '**valuation**' varied widely, and included:

- Valuation of ecosystems[10], for example in terms of their contribution to livelihoods, corporate profits, or to the local, provincial or national economy.
- Valuation of ecosystem services[11] — and in particular carbon sequestration and water and biodiversity — to assist in making tradeoffs between these services, assess their contribution to the national economy, incorporate their value in prices, and inform PES (e.g. payments for biodiversity and carbon sequestration).
- Valuation of externalities, including externalities associated with industry, mining, agriculture, and energy generation[12]; the costs of land degradation and land-use change; and the costs of climate change and of not taking immediate action.
- Comparing the different valuation techniques as they apply to the South African context.

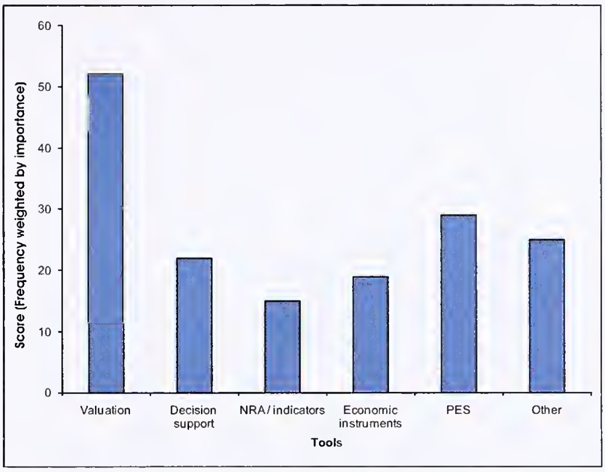

Figure 9 Research and policy tools that should be developed and applied in future research.

The important research needs within the '**PES**' domain included:

- Developing markets and other institutional mechanisms necessary for PES to work (see Section 4).
- Investigating and implementing PES through focus areas/pilot studies, and adaptive management thereof to ensure learning-by-doing (see Section 4).
- Mainstreaming conservation issues and ecosystem concerns into the financial world through PES (and other innovative economic mechanisms/tools) to secure financing for conservation and restoration.[13]
- PES linked with climate change (e.g. payments for carbon sequestration).
- PES linked with land-use options/management for landowners (e.g. commercial farmers, local communities and subsistence farmers), including on communal lands.
- PES linked with livelihoods and poverty alleviation.[14]
- The need for more data on the costs of controlling IAPs and on the transaction and other costs

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[10] Specific ecosystems identified included oceans/coasts, and woodlands/forests.

[11] There is a definite lack of South Africa-specific research/data on many ecosystem services (e.g. Rademan *et al*. 2009; Turpie 2009). The focus should be on developing rigorous methodologies to value specific services more accurately. At the same time, however, the importance of looking at all ecosystem services in a holistic/integrated way should be understood, as ecosystem services are interconnected and cannot be considered in isolation (Rademan *et al*. 2009). There is also a need for collecting basic biophysical data relating to ecosystem services (their nature, distribution, the relationship between the supply of ecosystem services and environmental quality, etc.) to inform valuation (Turpie 2009) even though this type of research is more within the realm of the natural sciences than ERE. Finally, a need was identified to value ecosystem services within protected areas, and within metro and local municipalities that currently have important biodiversity assets.

[12] A particular research need identified was to compare the *true* costs (including externalities) of electricity generation and water supply with the tariffs that consumers and industries actually pay.

[13] In particular, there is a need for research on restoration in developing countries, since most of the research comes out of developed countries, whereas the *need* for restoration is in developing countries. Furthermore, the research that is undertaken makes little or no impact on policy, and rarely makes links to PES. There is therefore a disjuncture between *concern* for restoration, the *need* for restoration, and implementation of PES (Blignaut 2009).

[14] Recommendations here included, for example, assessing the impact of PES on rural livelihoods, clarifying the links between PES and poverty alleviation, and using the revenues from a carbon tax to pay for PES projects in poor rural communities.

associated with developing PES (Wise & Musango 2009).

Finally, within the category of '**decision-support tools**', the need to evaluate tradeoffs emerged as an important issue, both in the questionnaire responses, and in the discussions during the conference. These included:

- Tradeoffs between different development/policy options (and the economic implications thereof).
- Tradeoffs between social, natural and manufactured capital (how to more effectively influence decision-makers to acknowledge these tradeoffs and consider them in decisions[15]).
- Tradeoffs between different ecosystem services (e.g. between carbon, biodiversity and water, as in the context of alien vs. indigenous vegetation).
- Tradeoffs between different components of biodiversity (and the related question of whether protecting individual *components* of biodiversity is the same as protecting biodiversity).
- Tradeoffs between bio-energy, waste and water in economic development planning.

3.3 Implementation

There are relatively few examples where ERE recommendations have been implemented at the national policy level in SA. For example, the Department of Water Affairs and Forestry (DWAF) has established a pricing strategy for raw water use charges that takes into account the costs of IAP clearing and management (Blignaut *et al.* 2007; Marais 2009). DWAF is also investigating fiscal instruments such as a charge system for discharges of waste into water bodies (Department of Water Affairs and Forestry 2000). The National Treasury has implemented a de facto carbon tax through a fuel levy, along with income tax deductions to incentivise stewardship agreements on conservation-worthy lands; it continues to investigate the use of environmentally related fiscal instruments in other areas. Market-based instruments have also been applied in the field of solid waste management, with a national product tax on plastic shopping bags, for example, which aims to reduce consumption of such bags and raise revenues for recycling them. Other areas of influence include, on the one hand, contributions to the 1998 National Water Act (Department of Water Affairs and Forestry 1998), the 2000 Coastal White Paper (Department of Environmental Affairs and Tourism 2000), and the 2004 Biodiversity Act (Republic of South Africa 2004). On the other hand, the thinking of large municipalities such as eThekweni and Cape Town also serves as areas of influence (City of Cape Town Health Department 2005; OneWorld Sustainable Investments 2008).

There has also been growing interest in, and attempts at implementing PES schemes (see Section 1) in southern Africa, including SA. A recently completed South African inventory lists eight PES schemes at various stages of implementation (Blignaut 2008). Three of the most recent are:

1. The Maloti-Drakensberg Transfrontier Project, which identified a strategy for developing incentives for land-users to enhance the supply of environmental goods and services (Diederichs & Mander 2004).
2. Government initiatives such as the Working for Water programme—a poverty relief public works programme that aims to create jobs and economic empowerment for the unemployed. It is made possible through IAP clearing operations funding. These operations address the problem of scarce water resources, and originated as a result of early ERE research in SA on the cost of fynbos degradation resulting from IAPs (Turpie *et al.* 2008).
3. The natural-capital restoration project in the Baviaanskloof area of the Eastern Cape, which focuses on restoring degraded landscapes by planting indigenous thicket vegetation (spekboom). The potential for PES lies in the ability of spekboom to sequester and store substantial quantities of additional carbon in both the soil and biomass (Mills & Cowling 2006). The social, biophysical and economic assessments are in an advanced stage and strategies are being developed for mainstreaming ecosystem services (and PES) into the management and planning of the area (Cowling *et al.* 2008; Wageningen University 2008).

Most of these efforts have involved detailed baseline assessments and model development; only a few, mostly those within the Working for Water programme, have entailed actual financial transfers, and even then the structure and practice of these schemes fall short of the theoretically ideal definition of PES. The reasons for the inability thus far of PES schemes to take hold are consistent with experiences throughout the world (and particularly in developing countries). PES schemes require:

1. Well-defined, tradable commodities as proxies for environmental services that can be cost-effectively measured and monitored.
2. Well-functioning, enforceable and transparent institutions and governance systems.

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[15] ERE has a potentially important role in getting the balance right between these three components of the 'triple bottom line' (Myrdal 2009). Current legislation is insufficient in that it lacks insights from an ERE perspective (Massey & Hamman 2009).

- A flexible mix of market, co-operative and regulatory arrangements.
- A mechanism for ensuring that the benefits and costs of PES are equitably distributed (Landell-Mills & Porras 2002; Jack *et al.* 2008).

The ERE research community in SA is focusing much of its efforts on overcoming barriers with respect to the economic arguments for PES. However, as discussed in Section 4, there has to be a focus on understanding the institutional context (e.g. how decision-makers operate), and on effectively communicating economic arguments to decision-makers, and it is here that valuable contributions have to be made.

The conference questionnaire sought to obtain delegates' opinions with respect to:

1. The extent to which ERE has made a significant impact on environmental policy and management in SA over the last five years.
2. The extent to which ERE is well integrated into environmental policy and management practice in SA.

There was no consensus with regard to the first question (Figure 10, left panel), with respondents' opinions differing widely. However, respondents were far more convergent in their responses to the second question (Figure 8, right panel), with most of them (82%) disagreeing with the statement that ERE is well integrated into policy and management practice. Many respondents believed that there have been few (if any) projects in which ERE has achieved success in implementation or management, and that the approach has yet to gain wider buy-in. This supports the view that there is an over-emphasis on academic and research issues, and on planning, while the focus on implementation is insufficient and ERE arguments are often not followed through to policy instrument design and policy-making processes. There is a definite need to incorporate insights from ERE into national strategy, and to convert strategy into implementation (Blignaut 2009).

When breaking these responses down by type of respondent (Figure 11), it is interesting to note that NGOs/civil society, funders and policy-makers themselves are more optimistic regarding the extent to which ERE has made a significant impact on environmental policy and management in SA over the last five years. On the other hand, however, researchers and practitioners are more pessimistic (top panel). Similarly, although all types of respondents were pessimistic regarding the extent to which ERE is integrated into environmental policy and management practice in SA, policy-makers and funders were again slightly less pessimistic than researchers and practitioners in this regard (bottom panel).

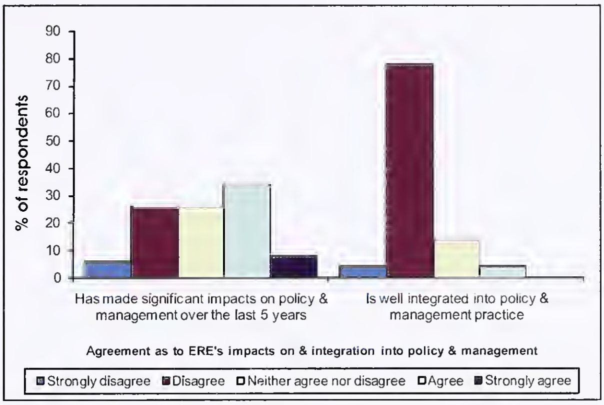

Figure 10 Extent to which ERE has impacted on/is integrated into policy and management.

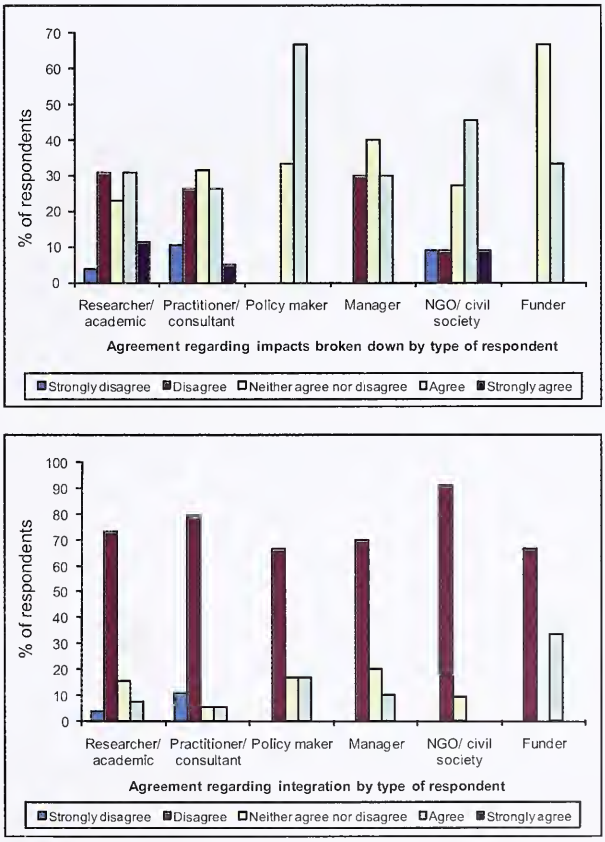

Figure 11a and 11b Extent of ERE impact and integration by type of respondent.

Respondents were also asked questions relating to the strengths and weaknesses of ERE with regard to its usefulness to policy-making, management and implementation. Respondents broadly agreed

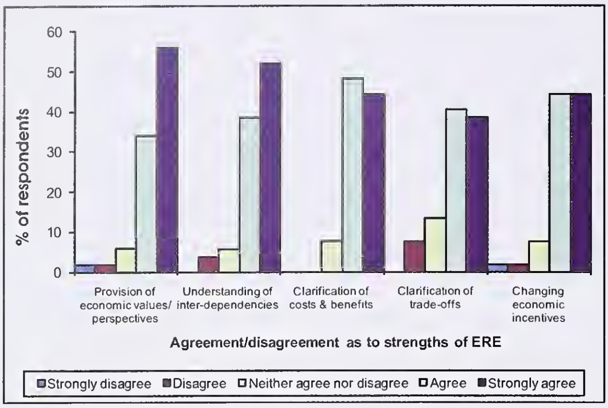

Figure 12 Strengths of ERE regarding policy-making, management and implementation.

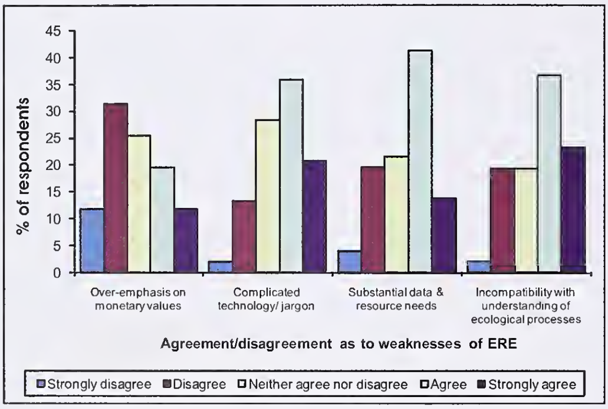

Figure 13 Weaknesses in terms of policy-making, management and implementation.

(strongly or mildly) on the strengths of ERE (Figure 12), including:

- Making provision for monetary values and/or economic perspectives that tend to get the attention of decision-makers.
- Understanding the interdependencies between natural and economic systems.
- Clarifying economic costs and benefits of environmental outcomes.
- Illustrating clearly, through scenarios, the trade-offs involved in taking decisions.
- Providing options to change economic incentives

Other strengths mentioned by respondents included:

- Raising awareness and forcing people to confront the consequences of treating environmental goods and services as 'free', as well as providing a philosophical base for understanding the interactions and interdependencies between our economic activities and the environment.
- The extent to which it has led to improved decision-making and the political and economic mainstreaming of natural resource management—and helped landowners, communities and local authorities make better decisions at the grassroots level.
- The extent to which economic valuation has made great progress in becoming more accurate; it provides a basis for taking emotions out of decisions, enabling more objective decision-making.

Similarly, most respondents agreed that the following aspects were weaknesses of ERE with regard to its usefulness to policy-making, management and implementation (see Figure 13):

- Complicated terminology and the use of jargon.
- Substantial data and resource needs.
- Lack of compatibility between policy-making, management and implementation on the one hand and (an understanding of) ecological processes on the other.

However, respondents tended to disagree with the statement that 'over-emphasis on the provision of monetary values' was a weakness of the discipline with regard to its usefulness to policy-making, management and implementation.

Although respondents were sceptical regarding ERE's current impact on, and integration into environmental policy and management (Figure 10), the vast majority of respondents (77%) strongly agreed that ERE has a more significant role to play in future environmental policy and management than it does at present (Figure 14), while another 19% agreed and only 2% disagreed. Most respondents recognised the need for ERE going forward, and the value that it could add to projects; they look forward to a time when ERE becomes a 'natural part of all project designs'.

4. Key outcomes and recommendations with respect to implementation

According to Dr Carlos Manuel Rodriguez, former Environment Minister in Costa Rica and now with Conservation International, it is not technological or financial constraints that prevent solutions to environmental problems from being found, but institutional constraints and a lack of political will. For example, in the debate on renewable energy, many would argue that the technology is there and that the cost constraints can be overcome. However, the problem of 'split ministries' (e.g. separate government departments dealing with energy and the environment) is an institutional constraint that leads to inappropriate decisions being made (e.g. continuing to build new coal-fired power stations rather than investing in renewable energy). Similarly, a lack of political will leads to governments investing more in military expenditure, for example, than in renewable energy (Rodriguez 2009). According to both Dr Rodriguez and Kristy Faccer of the International Union for Conservation of Nature (IUCN) (Faccer 2009), economics (and in particular, PES and other market-based instruments) can be used as a positive force to drive change, but it is important to:

1. Understand and be able to communicate the ERE toolbox, while acknowledging limitations.
2. Pay attention to political and institutional issues.
3. Build capacity in the use of these mechanisms through pilot studies.

Indeed, these issues emerged as three of the key recommendations of the conference with respect to implementation, and will be discussed in more detail below.

4.1 Knowing your audience, and speaking their language

One of the key themes emerging from the conference was the need for ERE practitioners and researchers to 'know' their audience, and to 'speak their language'. Information must be packaged appropriately according to the target audience, and results presented in terms that they can understand and relate to. In other words, the relevance, applicability and accessibility of information must be improved.

For example, putting *numbers* to the environment is key to being able to speak the language of businesses and policy-makers (particularly finance ministers), who generally make decisions based on economic or financial criteria (Faccer 2009). In particular, communicating the economic/financial value of ecosystem services is an important tool for promoting biodiversity conservation (Veldtman et *al.* 2009). These numbers tell government that (both political and economic) costs are high if immediate action is *not* taken. Thus, provided that the information is packaged appropriately, these numbers can be used to provide a good economic case for environmentally beneficial legislation (e.g. including tools such as PES within the legislative framework) (Rodriguez 2009). For example, in the implementation of PES in Costa Rica, it was initially difficult to convince the finance minister of the need for PES, because the argument was made in terms of the species that would be lost. A far more convincing case was made when the focus switched to the percentage of GDP that would be lost (Rodriguez 2009).

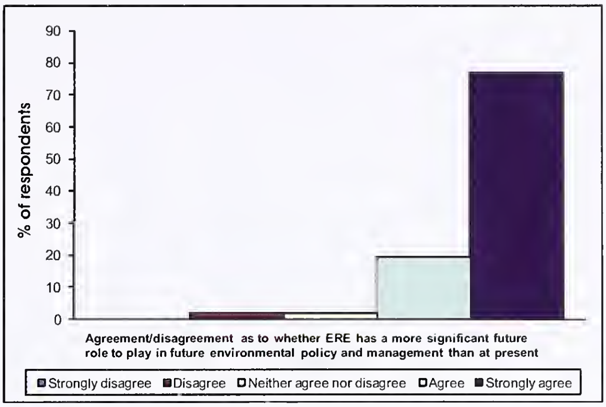

Figure 14 Extent to which ERE has a significant future role in policy and management.

It is also important to emphasise that the ecosystem service values that are presented relate to what is *currently* produced, and that even more could be realised if there was investment in natural capital to realise its full potential (Turpie 2009). For example, in the case of the Table Mountain National Park, there is a need to persuade the City of Cape Town that investing in the park essentially amounts to investing in future economic growth (Myrdal 2009). There is also a need to make society aware of the potential of tools such as PES (Blignaut 2009), and to show government a sample of success stories (Holden 2009).

In making the business case for conservation to the private sector, it must be borne in mind that finance managers think primarily in terms of the expected rate of return on investment, or benefit-cost ratios (De Wit 2009b). It is therefore necessary to 'think like a business, not an NGO' and to develop a standard product, well-packaged with real opportunities for businesses to add value, and in this way attract corporate investors (Houghton 2009; Huyser 2009). The private sector can also be engaged through voluntary schemes (e.g. certification) where compliance is in the best interests of the company (e.g. in terms of their public profile) (Rodriguez 2009).

It is also important to be able to speak the language of the development community. Because the environment is not seen as enough of a priority at the political level, it is necessary to show the links between ecosystems and socio-economic development, e.g. with reference to livelihoods or employment, in order to move conservation to the top

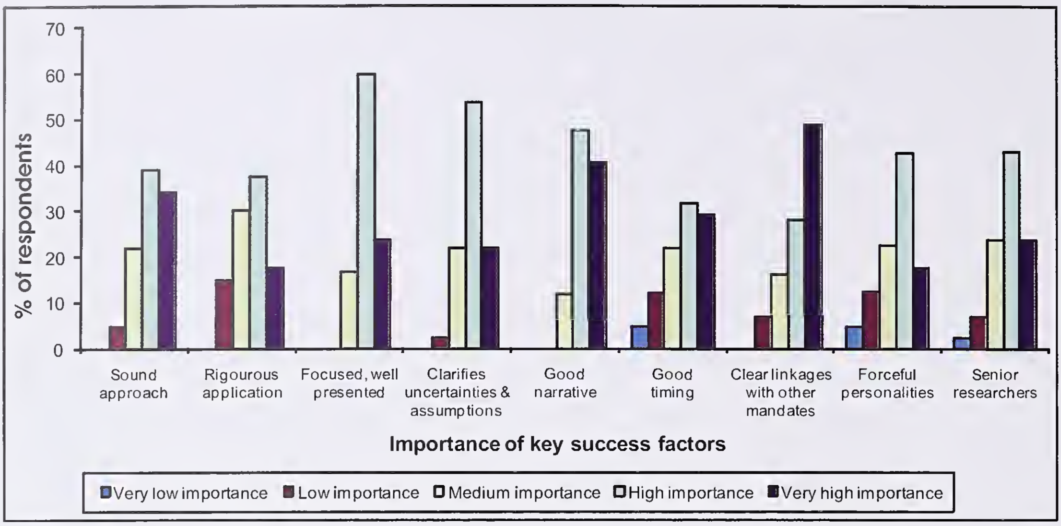

Figure 15 Key factors in ERE successes.

of the political agenda (De Wit 2009b; Rodriguez 2009). It must be shown that natural capital impacts on human capital in that it provides the basis for food security, water security, and energy security, which are necessary conditions for the development of human capital (Blignaut 2009). Huyser (2009) is of the opinion that if we want to sell them, PES and other tools for leveraging investment in conservation and restoration, such as biodiversity credits must be 'packaged' in terms of economic development, livelihoods or employment objectives, as well as conservation objectives. The ability to show dual benefits, and make socio-economic objectives explicit, explains the relative success of, for example, the Working for Water programme (Myrdal 2009; Tessendorf 2009).

Finally, it is also important for ERE practitioners to use a language that landowners, communities, and local authorities can understand when *they* are the target audience. ERE practitioners and researchers in SA have to be clearer regarding *what* they mean by 'value', and *who* it is that benefits, *when* they benefit, and *how* they benefit (Abrahamse 2009). For example, stewardship often comes across as a restrictive, top-down approach. Similarly, restoration has had positive eco*logical* impacts, but the benefits to local communities must also be highlighted (Sigwela 2009). It is therefore important to develop a platform to engage and incorporate insights from affected local communities, who can add value to the debate and ensure greater legitimacy of the results (Abrahamse 2009; Marais 2009). In other words, one has to understand and address the real needs[17] of the communities, package ecosystem services within a context that they can understand and appreciate, and provide opportunities for learning and sharing knowledge between communities (Sigwela 2009).

The importance of clearly and effectively communicating results of research was also highlighted in the questionnaire, where respondents were asked to consider projects in which they have been involved that have used ERE and achieved successes in implementation and management, and to rate each of the following factors in relation to their importance in contributing to these successes:

- Conceptually sound approach to supporting research.
- Rigorous application of ERE techniques.
- Well presented and focused results.
- Use of scenarios and other ways to clarify uncertainties and assumptions.
- Provision of a good narrative to augment figures and clarify key points.
- Good timing in the political and budgetary cycle.
- Ability to show linkages with other mandates that are not obviously environmental.
- Forceful personalities to drive processes.
- Availability of senior researchers to interact with decision-makers.

Respondents were in broad agreement as to the importance of these factors, with most rating the

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[16] The question of *timing* of benefits is an important issue, as the delay in the benefits derived from improving/maintaining the environment often frustrates the intended beneficiaries and limits the attractiveness of such projects.

[17] These needs tend to be immediate, but, as mentioned above, the rewards tend to be delayed, emphasising the need (and an important role) for government.

importance of each of these as high or very high, or of medium at the least (see Figure 15).

In particular, respondents agreed that focused, well-presented arguments and results are important factors in the successful implementation of recommendations arising from ERE research. It implies that such arguments and results are clearly and effectively communicated to decision-makers. Such arguments and results should, furthermore, clarify uncertainties and assumptions, and employ a good narrative. There is a need to be clear about what the results mean, to explain complicated terminology/jargon, to be realistic regarding the implications of the results, and to make any assumptions and limitations clear, rather than claiming that the information provided can be used as a 'blueprint' or panacea. This is necessary because of the number of assumptions made, the amount of terminology/jargon employed, the relatively intangible nature of concepts such as indirect and existence values, and the fact that decisions cannot usually be made based on economic criteria alone. It is important to emphasise the value and importance of the information presented, without overwhelming the audience with technical details. Respondents emphasised that the use of good communication (clear and easy to understand) greatly impacts on the end product, and that presentation is crucial, as decision-makers are pressed for time and easily irritated by unclear and untidy work.

Related to this, the ability to show linkages to other mandates was also highlighted as being important in a milieu where co-operative governance and partnerships are seen as key levers. Respondents also emphasised the importance of having senior researchers available to interact with decision-makers, and of strong champions of ideas. For some, this was related to the idea of good timing in that political issues (at all levels) often drive successful implementation. Also, these issues are cyclical, so that there will be times when the end-users of information will be more receptive than at other times. Champions, therefore, have to be persistent and patient and time their initiatives to coincide with times when the end-users are receptive. Periods of crisis and change, such as the current global economic crisis, also tend to present opportunities for new ideas.

4.2 Paying attention to social, political and institutional issues

The need to pay attention to social, political and institutional issues also emerged as one of the key themes of the conference. There are both market and political/institutional failures that prevent solutions to environmental problems from being found (Rodriguez 2009). Many existing policies, markets and prices are unsupportive of livelihoods and sustainability—some policies tend to marginalise the poor. Subsidies and other price distortions create perverse incentives, given that there is a lack of functioning markets. All these factors combine to ensure that there is too often little benefit from conservation (Faccer 2009).

The regressive nature of the plastic bag levy in SA, for example, suggests a failure to sufficiently account for social issues (Dikgang *et al.* 2009), while the manner in which government later bowed to pressure to lower the price of plastic bags suggests a lack of political will, and diminished the effectiveness of the legislation. Furthermore, the failure of government to use the revenues appropriately has also undermined the effectiveness of, and public support for the levy, relative to what might have been the case if the funds had been ring-fenced for providing alternatives or for subsidising collection, re-use and recycling. Another example from SA is that of water tariffs, which, as a result of governance/institutional issues, do not account for watershed services, and are therefore too low (Marais 2009). Although the costs of clearing IAPs is included in the national water pricing strategy, there is a need to account for watershed services more generally, and an initiative to rectify this situation is under way (Marais 2009).

Putting the correct political and institutional structures in place is crucial to overcome these types of problems. In Costa Rica, for example, the market share of renewable energy increased from 50% to 98% when the environment and energy ministries were combined (Rodriguez 2009). Another example is that of PES, which has been successful in Costa Rica because institutions have been built upon the principles of sustainability, and because its protagonists were able to convince Congress of the benefits of natural ecosystems for human wellbeing, and thus of the potential win-win opportunities from PES. A key factor in the debate was the market-oriented and financially neutral nature of the mechanism, which ensured that it received the backing of the finance ministry.

Another set of problems of particular relevance in the South African context relates to weak governance and tenure arrangements, a lack of capacity among both municipalities and rural communities, and the complex nature of rural economies, which require integrated approaches to understanding, developing and implementing solutions (Sigwela 2009). For example, in the context of mechanisms for leveraging conservation, as well as other market-based mechanisms, there is a minimum level of governance/capacity that is required, especially in terms of enforcement. Furthermore, although a great need exists for intervention targeting rural communities, there are problems in delivering on promises, largely because current approaches (such as the various 'Working for…' programmes) do not always take the complex nature of rural economies into account, i.e. they are not integrated, and are not designed to ensure longevity and stable employment creation (Sigwela 2009).

According to Stein Holden (2009), one of the main types of institutional failures is that of 'power traps', i.e. institutional 'blockages' related to weak institutions and unequal distribution of power. It is an indication of the need to focus more on the *political* economy if successful implementation of good ideas is to be achieved. Institutional reforms are an important precursor to market reforms, and therefore to environmental restoration. For example, in Ethiopia, land reform was successful because the 'power trap' was broken (the landlord elite lost its power), and local institutions were established. By contrast, power traps are still undermining efforts at institutional reform in many other African countries.

In the South African context, it is fair to say that the economy is still structurally and institutionally divided between the 'top deck' (the wealthiest 20% of the population, who earn 65% of the income), and the 'bottom deck' (the poor). Economic policies are largely centred on the 'top deck', with the assumption that benefits will 'trickle down' to the poor (Blignaut 2009). However, this expectation has not been realised in practice. Among other measures, closing the gap between the two 'economies' can be facilitated by investment in natural assets (Sigwela 2009). Because PES can realise both conservation and livelihood objectives, it could be an important tool for bridging the structural divide in SA, creating a 'trickle-up' effect instead of a 'trickle-down' effect (Blignaut 2009). The 'bottom deck' has access to natural resources, and can therefore 'supply' ecosystem services, whereas the 'top deck' has access to financial resources, and a 'demand' for ecosystem services. Thus, although there is currently a lack of well developed markets for ecosystem services (Sigwela 2009), the ingredients for the development of such a market are there (Blignaut 2009)[18].

Furthermore, since the environmental legacies of apartheid have not yet been eradicated, financially poor rural areas, which have the highest supply of ecosystem services, also happen to be priority areas for restoration (Blignaut 2009). PES therefore has the potential to result in win-win outcomes (socio-economic and environmental). There is already evidence suggesting that various large-scale restoration projects have been highly beneficial (e.g. Maloti-Drakensberg), and that PES could be the ideal vehicle to take conservation and restoration forward—perhaps even replicating the Costa Rican model (Blignaut 2009). However, this requires that the institutional barriers are overcome, and that solutions are found across various institutions and disciplines, rather than from within a single institution or discipline. A need therefore exists for institutions similar to those in Costa Rica to establish links between payment institutions and local authorities, and to overcome the problem of split ministries. This is yet to be discussed within the South African government (Blignaut 2009).

It is clear that there is a need for research towards putting the correct institutional, governance and economic structures in place for ERE policies to be effective (e.g. developing markets and other institutions necessary for PES to work). Current policies have to be evaluated in terms of where they are failing and how they should be changed. For example, the extent to which mainstream economic policy and market practices have undermined the natural resource base should be quantified.

4.3 Applying what we already know through pilot studies

Another key lesson emerging from the conference was the need to find ways to apply what we already know through pilot studies on the ground. Because the research process is time consuming, it is often not possible to wait until we have all the answers, such that learning by doing becomes necessary. Furthermore, it is generally difficult to identify a *priori* optimal policy or policy combination, implying the need for step-wise testing and adaptive management. In other words, pilot studies should be designed in such a way that they can be systematically tested and adapted as new information becomes available (Holden 2009)[19].

In turn, provided that appropriate monitoring takes place and that data are collected and collated, important information will be generated through the implementation of pilot studies, which can then be used to inform future projects and policies (Marais 2009). For example, there is a need for basic biophysical data relating to ecosystem services, as well as data on their value (Marais 2009; Turpie 2009). Although the Maloti-Drakensberg project established important baseline data, and the Baviaanskloof project is contributing further to our knowledge, there is a constant need for more data, which can be obtained through further PES pilot studies (Marais 2009).

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[18] There was also a suggestion that in some cases government could be a buyer in a PES market, in order to fulfil its obligations to provide public goods. For example, DWAF could be a buyer in a market for watershed services, in order to meet its requirements with reference to the ecological reserve.

[19] One respondent also suggested that there is a need for a robust, coarser decision support model or matrix that is less reliant on data, and within which decisions can be made on the basis of existing data (and adapted as more data become available). This will ensure that the environment does not suffer as a result of decisions being delayed while data are still collected.

At the same time, however, there are economies of scale in projects in which market-based mechanisms are applied (small projects are often not cost-effective and carry a disproportionate amount of risk). There is also a need to focus on expanding regulations and projects across different types of systems (Knowles 2009). This implies the need for a national-scale approach, such as the Sustainable Development Policies and Measures (SD-PAM) approach proposed by Winkler *et al.* (2007). However, this requires the development of government capacity and the leveraging of international funding to implement national-scale projects (Knowles 2009).

5. Conclusion

There is a growing demand for ERE research in SA, fuelled by a greater appreciation of the need to understand the economic roots of environmental and social challenges and to formulate economically sound solutions. However, there is limited capacity to address this growing demand, and a clear need for capacity-building to increase the number of environmental and resource economists in SA. Some of the key recommendations from the conference with respect to capacity-building included:

- Developing and implementing a plan for building ERE research and development capabilities and capacity.
- Government investment and support (financial and other[20]) at both the undergraduate and postgraduate levels.
- Developing a range of undergraduate and postgraduate courses and programmes, ranging from short courses in ERE for non-economist graduates working in other fields (continuing education), to courses for students pursuing other degrees, to a specialised degree in ERE.
- The need for a comprehensive database of people trained in ERE, and for a drive to attract and recruit potential ERE researchers and practitioners working in other sectors and fields.

With regard to research, a number of important topics for future ERE research were identified, relating primarily to land, water and climate change. For these purposes, tools such as valuation and PES can be used to address environmental and social problems associated with information failures, market failures and political/institutional failures. The suggestion that respondents were thinking in terms of reinforcing existing behaviour rather than pushing frontiers of research came as no surprise, however, given the interests of conference attendees, and the dominance of responses in the land and water categories. This serves to highlight the need for a needs-driven research programme, i.e. for a working group to identify priorities and research gaps, and to develop an overall research plan for the field in SA. Importantly, it should include a framework for ERE research in the country to better co-ordinate such research. In addition, since research activity tends to gravitate towards areas for which there is funding, a need exists to encourage the channelling of funds to research in the priority areas identified.

Going beyond research and planning, and placing more emphasis on implementation is critical if ERE recommendations are to be followed through to policy instrument design and policy-making processes. In particular, there is a definite need to incorporate insights from ERE into national strategy, and to convert strategy into implementation (Blignaut 2009). Many delegates highlighted the need to find ways of mainstreaming and implementing ERE into management, policy and decision-making as an important area for future research. This research will have to determine, among other things, how ERE approaches can be integrated into planning and decision-making, from the local level up to the national strategic level (i.e. what processes have to be followed, what capacities are required, etc.).

One of the key obstacles to implementation is the mismatch between the research that is undertaken and the needs of the end-users of such research, so that the research undertaken does not engage the priority research needs. Lack of communication between those who undertake the research and those who commission it, or who use the outcomes of such research in making decisions is an important reason for failing to integrate research and end-user needs. The generators of knowledge (researchers and practitioners) fail to communicate the importance of their research effectively, while lacking understanding of the real needs and concerns of the users of such research.

There is therefore a need for regular, two-way communication between the generators and users of knowledge. While practitioners and researchers should emphasise the importance of the research that they are undertaking to ensure that its relevance is understood and to secure sufficient funding for their research, they also have to listen to the end-users of research to understand their needs and concerns. Some of the recommendations in this regard include:

- Stakeholders should be consulted at an early stage of the research process to ensure that their needs are engaged from the outset (Cowling *et al.* 2008).
- There is also a need for conferences and other such events on a more frequent basis to ensure

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[20] For example, provide support that fast-tracks processes for getting ERE courses, degrees and diplomas developed, approved and implemented within tertiary (and other) institutions.

that opportunities for learning and cross-pollination are created. A regular forum for discussions between the generators and end-users of knowledge must be created to ensure that the research that is undertaken is relevant, and that it can be readily taken up by decision-makers. However, the issue of funding has to be addressed.

- Consider the development of a strategy for mainstreaming ERE research. This should be based on a formal assessment of the discipline and of the factors underlying the current mismatch between the research that is undertaken and the priority research needs, e.g. a SWOT analysis (strengths, weaknesses, opportunities and threats), perhaps based on a modified version of Cowling *et al.*'s (2008) model for mainstreaming ecosystem services for implementation. This should include a strategy for mitigating threats[21] and for taking advantage of any opportunities[22]. A SWOT analysis has been undertaken to some extent (e.g. as contained in this report), although more work may have to be done in this regard. The next step is to organise a planning workshop, involving those who undertake research, as well as the end-users and funders of such research.
- There is a need for strong champions and knowledge brokers to bridge the gap between the generators and users of knowledge, i.e. to take ERE suggestions forward to policy level and to ensure that they are understood and implemented.
- Finally, since there is often limited capacity within the receiving environment, implying that ERE results and recommendations are not well understood, there is a need for short courses in ERE aimed at the end-users of ERE research.

According to Dr Rodriguez (2009), SA has strong potential to be a leader in sustainable development. However, this requires that institutional constraints, such as 'power traps' and a lack of political will, are overcome. It also requires that ERE researchers and practitioners become more confident in the knowledge, information and data that they already have. Other requirements include improved implementation and impact, based on sound understanding and experience, as well as clear and simple communication. In this regard, the following key recommendations emerged from the conference:

- Know your audience, and speak their language. It is important to be able to communicate your results effectively (clearly and coherently), and to package them appropriately in order to influence decision-makers, and to convince them of the importance of ERE.
- Pay attention to social, political and institutional issues. There is a need for research towards putting the correct institutional, governance and economic structures in place for ERE policies to be effective (e.g. developing markets and other institutions necessary for PES to work), and to be cognisant of and sensitive to issues related to political economy.
- Find ways to apply what we already know through pilot studies on the ground. Do not be afraid to make decisions (or even mistakes), even if you do not have all the information, as long as it is not imposed on local communities without their understanding and support. In fact, we should not underestimate how much we know; in all likelihood, we know substantially more than Costa Rica did when PES was widely implemented there. But it is essential to design and implement pilot studies in such a way that they can be withdrawn or adapted later, i.e. within an adaptive learning and adaptive management framework that is responsive to the local context.

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[21] An example of a threat is the loss of qualified ERE researchers and practitioners to other fields of work, or to the overseas market. It is therefore important to find ways of developing, attracting and retaining senior researchers and practitioners.

[22] Examples of opportunities include the DST Global Change Grand Challenge, which focuses on a variety of issues relevant to ERE, institutional economics and ecological economics. It also identifies the economics of global change as an important area for future research, and prioritises it for future funding. In the context of a developing country, SA provides potentially interesting research opportunities that may be of interest to overseas funding agencies.

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